

Historical

UBIQUE - SUB AQUA

AN HISTORICAL REVIEW OF THE ORIGINS OF SERVICE DIVING.

First Dive , Aged 58

We shall never know what was in the mind of that one-armed Colonel of the Royal Engineers as the murky waters of the Medway closed over his head on 28 April 1838. Certainly there could have been no fear. A veteran of the Peninsular Campaign and having been severely wounded by shot and bayonet at the Siege of Walcheren, he had had his share of hand to hand fighting. Possibly there was some puzzlement as to why he, the Director of the Royal Engineers Establishment, was risking his life at the tender age of 58. But, being of a highly inventive disposition, he was probably congratulating himself that the honour of being the first Service diver in the world had fallen to him. Possibly even, this scholarly senior officer with the schoolboyish sense of humour was amused that he, Colonel Charles Pasley, was turning the Regimental motto of "UBIQUE" ("Everywhere") to "SUB AQUA" ("Underwater").

Certainly he must have known the risks involved, as Mr Deane's Common Diving Apparatus was still relatively unproven, although John Deane and his brother Charles had been diving on the Royal George since July 1832.

John lived some twenty miles from Chatham, and it is suggested that he and his brother first became involved with underwater diving through a combination of Charles' caulking firm in Deptford and as the result of a fire on the family farm in 1830. After early attempts to pump water from a pond onto the fire had proved ineffective, John Deane reputedly removed the helmet from a suit of armour standing in the Hall, secured the pipe to the inside, and, instructing the labourers to pump slowly, placed the helmet on his head and walked into the stable through the dense smoke to rescue the horses. Soon after, in 1832, Charles patented an "Apparatus to be worn by persons entering a room filled with smoke or other vapour for the purpose of extinguishing fire or extricating persons or property therein!"

John Deane adapted the helmet for use underwater and, after an early mishap when the air in his helmet upended him, he added lead soles to his boots. He was then able to join the "sweepers", salvaging the many anchors and cables that littered the shallow seabed of the Thames Estuary.

So confident were they of the "Common Diving

Apparatus" and of their diving abilities, they tendered to the Admiralty for the major underwater salvage of the Royal George at Portsmouth. This unfortunate vessel had been the victim of early cuts in defence expenditure, and although declared unseaworthy, the thirty-six year old three-decker had been commissioned to join the fleet attending the Siege of Gibraltar. However, before she could sail from Portsmouth, her rotten timbers collapsed as she was being heeled over for a minor underwater repair, and she sank at her anchorage, joining two other naval wrecks there, and seriously blocking the harbour entrance.

It was two other wrecks, those of the collier William and the schooner Glenmorgan lying off Tilbury, and making navigation of the Thames extremely hazardous, that caused the Royal Engineers to become involved with diving and underwater demolitions, leading later and inevitably to the formation of the "Royal Engineers Submarine Mining Service."

The Corps had been responsible already for a number of shallow water demolitions as a result of Colonel Pasley developing an effective water-proof fuse for initiating charges underwater in 1825. His method

"....the logistics of positioning and operating a bell were daunting...."

was to seal the charges in metal containers which were then contained in timber casks. The initiation was fraught with difficulties: it required the gunpowder train to be fed through 1.5 inch diameter lead tubes which could be up to thirty feet in length. This, coupled with the immense difficulties in locating and fixing the charges in any appreciable current, caused Pasley to change from using a number of small charges, to concentrating on a few, larger charges.

In his first attempts to remove the brig William in the late Autumn of 1837, Colonel Pasley employed the traditional salvage techniques used by the Master Attendant of the Dockyard at Chatham, but to little purpose. Along with a very obvious need for improved and reliable underwater demolition practice, clearly some

more satisfactory means of reaching the site was required. For the 1838 operations, Pasley decided to continue to use the Dockyard diving bell for taking the charges to the site, but to use divers for placing them. He appreciated that the logistics of operating and positioning a bell were daunting, for nearly sixty seamen and four lighters would have to be employed in mooring and moving the bell, whose bulk proved unmanageable in currents approaching one knot. By employing divers for taking the charges from the bell to the site, he hoped to reduce considerably the lengthy and manpower-heavy operations in fine-positioning the bell. This was a bold idea, a logical one, but also an idea closely related to the urge to use the new technology that was developing in Victorian Britain. Nowhere was this more so than off Spithead, where the feats of the salvage divers working on the Royal George had caught the nation's interest. In 1835 there had been a frenzy of diving activity, and two forms of diving dress had been patented by "gentlemen divers" called Fraser and Bethel. Other pioneering divers were borrowing ideas and developing their own equipments, but the Deanes were pre-eminent in experience and the proven safety of their equipment, so it was to them that Pasley turned.

The Deanes, however, were much in demand around the country, and so although Pasley noted that *"they urgently requested to be employed"*, he could not get them to name their terms! Open-ended contracts were, even then, frowned upon by the Board of Ordnance, so he decided that the Corps would have to do its own diving. Therefore, in February 1838, whilst new demolition techniques were being tried and tested in the Medway, demonstrations were given of various diving equipments, and that produced by Mr Kemp was selected.

By April, Colonel Pasley and his volunteers had completed their dry training and familiarisation with the equipment, helped no doubt by the excellent Diving Manual that the Deanes had published. The trainee divers would have noted from it that not only should *"the diver dress in two pairs of stockings, two drawers, and two Guernsey frocks, with a handkerchief tied around the neck to keep the frocks well up"*, but more importantly that *"No person should on any account whatever, be suffered to descend in the diving Apparatus, or to attend the signals, unless they are perfectly sober, calm and collected"*. The signals that the Deanes had devised to communicate with their divers by a hand line, are remarkably similar to those still used today, "One Pull" being used by both

signalman and diver to indicate that all was well, and a constant jerking of the line indicating that the diver was to be brought to the surface at once.

So, Pasley decided that the Corps was ready to make that "*small step for man*", but in this case, underwater. As a man who had always led from the front in battle, and was now pioneering this new discipline of diving, who had a better right than he to be the first underwater? But whilst rank has its benefits, few of the Sappers on site would have wanted to change places with Pasley and risk their own lives on this unnatural venture into the murky waters of the Medway. On returning to the surface, the Colonel remarked that the equipment had been "*comfortable*". He then gave the helmet to Sgt Young who was already, dressed for diving, and who then became the second serviceman to dive. By 5 May, and possibly in strict seniority, Cpl Mitchell was given his first dive, and fixed two eyebolts in a baulk of timber placed on the river bed. Colonel Pasley recording at the time that Cpl Mitchell, "*had never used a diving helmet before, and yet he remained under water for three quarters of an hour, which has satisfied me that there is neither difficulty nor danger in the use of this apparatus, which I also know by my own experience, having gone down first myself, which I thought was the best way of forming an opinion of the practicability of the proposed operation*".

All was now ready to begin the demolition and removal of the brig William and the collier Glenmorgan. The Port Admiral had been instructed to send some naval riggers to assist in the bell operations, and the Water Bailiff of the Port of London arranged for the steamer Swiftsure to be in attendance, and to fly and fire the necessary warning signals when the river had to be closed to ships whilst the demolitions were being fired. Operations started badly when, on 21 May, the now possibly over-confident Cpl Mitchell had overstayed his dive time on his second dive of the day. His attendant had become increasingly worried that Mitchell had not been responding to his signals and reported this to Capt Yule who was supervising the diving operation. One last "pull" was given, but by the lack of any response, the worst was assumed. Col Pasley personally took over the rescue attempt, risking his life in the diving bell which became increasingly unmanageable as the tide had started to run. The bell dive had to be aborted, and on the next attempt at slack water, they found that Cpl Mitchell had become entangled and suspended in the collapsed rigging of the William, and, being unable to cut himself free, had drowned.

Within the week the first of the two 2,500 lbs powder charges that Pasley had prepared had been laid on the brig William, but it was to be fired by an improved fuse consisting of a linen tape filled with gunpowder, enclosed

within a lead tube. This tube was extremely difficult both to join to the charge and to support through the water. The fuse was the most vulnerable point of the operation, but Pasley was sufficiently confident to publicise the proposed demolition day, and many city officials joined the vast crowds who had come to watch the explosion.

"A beautiful explosion" wrote Pasley afterwards, for parts of the brig's timbers and rigging had been carried upwards in the column of water from the blast. To have got it right first time was an achievement, but the really satisfying part was when a check next day from the diving bell showed that the William had "*ceased to be an obstruction*", and that the channel depth had been increased to 5 fathoms clear of any debris.

A confident Pasley now attacked the Glenmorgan with his second charge, and this too was successful, exceeding his wildest hopes. The Thames was now clear of obstructions, and a grateful Lord Mayor presented Pasley with the Freedom of the City

"....a beautiful explosion...."

and a Gold Medal. In spite of his success, the problems of the underwater fuses continued to concern Pasley. He knew he had been lucky on these two very public occasions, but their innate unreliability and difficulty of handling, made him turn to a relatively new invention then interesting the scientists and inventors: electricity.

Over at Portsmouth, the Deanes were continuing their salvage operations on the Royal George, but during 1834-36 they had removed most of the salvageable, but essentially sellable, material and guns. Now they were slowing down the work as the remaining salvage was deep within the wreck and could only be reached using demolitions. In early 1839 Pasley was considering a much larger, and altogether a more daunting project - the clearance of the Royal George. Success on so grand a scale and on such a public site, would confirm the R.E. Establishment as being in the forefront of Victorian technology. He had not wanted to be rushed in planning this project, but the active interest being shown by the Deanes in wanting to use his electrical initiation, prompted Pasley into taking rapid action. In March he lodged a letter of intent with the Board of Ordnance, asking that he be allowed to approach the Admiralty directly with a view to "*forming a plan of operations, and computing the cost of its destruction by blowing the woodwork to pieces, and weighing the guns and waterlogged oak timber*".

By 25 May he had completed a carefully considered and calculated plan, based upon his experiences in the Thames' Operations the previous year. He estimated that he could *"carry out the clearance within two working seasons, using RE and civilian divers, a diving bell manned by the Navy, and a working party of about twenty NCOs and Sappers. The whole would not exceed £2,500; and if operations begin in the current year (1839), then there can scarcely be a doubt of the Anchorage at Spithead being put into a fit state for a British Fleet, in the course of the Year 1840".*

These were brave words, far braver than Pasley could then realise, as they were based on the relatively little experience he had gained on the William and the Glenmorgan. Surface engineering can be readily quantified, with the only variables being weather and luck, but even to this day we fail to appreciate the unforeseen and unknown problems of operating underwater. Even the recovery of the Mary Rose with all modern diving and recovery techniques available to the planners and diving teams, still managed a five months slippage on a five month recovery task, and was close to becoming a very public and humiliating disaster.

By July, Pasley had been given the approval that he needed. Within the month he had a fleet of three Dockyard lighters moored on site and his divers and work force were quartered on board the hulk Success. Capt Williams RE was in charge, but inevitably Pasley spent much time on the site.

The great good luck that had shone on Col Pasley's underwater endeavours at last deserted him, temporarily but humiliatingly. On lowering the first of the two 2,500 lbs charges to the wreck, the first became caught up in some obstruction and had to be recovered to the surface. The second was successfully placed by the divers, the fuses prepared, the warning flags flown and the bugles sounded, the electrical contacts made - and nothing. A complete nothing that was being watched by Royalty and many distinguished personages. As a result of this, Pasley sacked his chief civilian diver, dispensed with the naval diving bell and restrengthened the charge casings which had leaked at the depth of 96 feet.

A delay of three weeks followed whilst these problems were resolved. But on 17 September, Pasley felt confident enough in the improvements that he had made to try electrical initiation again. With an eye to his future, or perhaps as a let-out should there be another failure, the Officer in Charge of the Demolition, Lt Symmonds RE, tactfully allowed Pasley's 7 year-old son to *"complete the circuit"* on a small charge of 260lbs, and this time it worked. Within the week they were able to use the now strengthened 2,500 lbs charges which, whilst proving very effective

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underwater, became one of the earliest tourist attractions. On firing days, crowds lined the foreshore in front of Henry VIII's Portsea Castle, to watch both the impending spectacle and the inevitable amateur yachtsmen entering the site area and on occasion ramming the workboats.

"It must be considered one of nature's miracles", wrote Capt. Basil Hart RN in the United Service Journal, *"for certainly nothing can be more surprising than the tap of one wire against another, in a boat or vessel, should instantaneously ignite gunpowder and break to pieces the strongest masses of wood and iron at the bottom of the sea, at a great distance from and with perfect safety to the operator".* This last remark was perhaps more optimistic than the gallant Captain, anchored immediately above an underwater charge, ever realised, and remains one of the more interesting experiences of today.

Work resumed on the Royal George in 1840, but Lt Symmonds RE and a small detachment were tasked with the removal of the wreck of the frigate Edgar. A chance spark had rapidly turned to a raging fire which reaching the magazine and the vessel had blown up: She now lay on the Mother Bank off the entrance to Wootton Creek on the Isle of Wight. Pasley, meanwhile, turned his attention to improving the diving equipment. The Royal Engineers had been using two of the Deanes' Common Diving Apparatus since the start of the Royal George operations, although he himself had originally dived in Mr Kemp's dress and used it for the removal of the William and the Glenmorgan in 1838. Recently he had introduced two sets of Siebe's design, which proved very popular with the military and civilian divers. They objected strongly however to Bethell's equipment which took some twenty minutes to undo the twelve cumbersome locking nuts and remove the helmet. The divers were making between three and seven short dives a day, and, as they liked to be able to take off their helmets and breath fresh air on surfacing, they found Bethell's equipment too time wasting.

Augustus Siebe was a remarkable man. A former Austrian Gunner, he had come to this country and was practising as an engineer of some skill and inventiveness. He had already a number of Patents to his credit, from papermaking machinery to hydraulic apparatus, but he was adept at improving other people's ideas. As such, he proved invaluable to the Deane brothers when he collaborated with them and was responsible for major improvements in their air pumps, enabling them to work at far greater depths. It was this facility for improvement coupled with the strong possibility that one of the brothers parted with his rights to their invention, that made the manufacturing firm of Siebe Gorman pre-eminent in diving equipment for a century, and also started the myth that Siebe had "invented" the original diving apparatus.

By December 1840, Pasley was able to complete his Technical Evaluation. In his Report to the Inspector General of Fortifications, W044/613 dated 30 December 1840, he praised the Deane's Apparatus, *"which is simplest of all, though very efficient for common purposes, and highly approved by many of the best divers, (it) does not admit of a man lying down or stooping with his head lower than his body, without a risk of his helmet filling with water, and if he should by accident, or by neglect of his assistants fall over into a hole, or down the side of a wreck head foremost, he will be drowned, if not hauled up immediately".*

Pasley came down strongly in favour of Siebe's apparatus, which he himself had helped to modify, and he recommended it for *"Public Service"*. It is essentially almost the same design which is in regular use around the world today, due to the simplicity of operation, maintenance and training.

Work on the Royal George continued, slowly but surely, but the original over-confident target date of completion in the season 1840 was long past before the Royal Engineers were able to withdraw. The problems of working underwater off Spithead in mostly nil

"....his military divers suffered from repeated attacks of 'Acute Rheumatism'...."

visibility, the complex vagaries of the strong tidal currents, and the effects of pressure on the divers working at depth had not been anticipated or evaluated properly. The cause of the Bends, or "Caisson Disease" (for it was first identified in tunnellers) from working in compressed air, was then unknown. With hindsight it is interesting that Pasley's civilian divers had some gutfeeling about the dangers of repetitive dives, and he had to sack them as they showed a marked, and instinctive, reluctance to work the long hours that he expected from his disciplined military divers. These were known to have suffered from repeated attacks of *"acute rheumatism"*, one of the simpler definitions of the early stages of the Bends.

Nor were the incredible effects of seabed scour off Spithead fully understood. The unfortunate Lt Symmonds RE had *"destroyed"* the wreck of the Edgar in 1840, blowing it into three pieces. But in 1844 a check sweep revealed that whilst the bow and stern had gone, the centre section had now been uncovered from the mud, and stood proudly almost 13 feet high! Lt Barlow RE finally blew it later in 1844 as a conclusion to the Royal Engineer operations off Spithead.

This had been a prolonged affair, which must have become really tedious and repetitive after the initial euphoria of 1840 had worn off. True, there had always been something new to occupy the divers and the support team. Major General Pasley, for he had been promoted on 23 November 1842, persuaded the Navy that the improved diving apparatus and techniques had surpassed any benefits that they had obtained using diving bells in the Dockyards. So, in 1843, he had detached LCpl Jones to instruct thirteen Petty Officers and Seamen from HMS Excellent in the *"discipline of diving"*, which had been included in the R.E. Establishment training since 1839.

He had insisted too that meticulous records were kept of all the artefacts recovered, following the lead of the Deanes in Underwater archaeology. Some of the watercolour drawings by Sapper draughtsmen are now in the Science Museum. His variants of electrical initiation were based on his experiments with land line telegraphs. Under his direction, Capt Hutchinson RE had tried using a single cable with a water return, *"in which"*, wrote Pasley, *"he was very zealous, but to little effect, as the method required a battery of double the power".*

His attempts to initiate multiple charges underwater proved ineffective and costly, as *"we lost a great deal of powder, as we never succeeded in firing more than two charges simultaneously out of a great number, and the cases containing the second charge were generally burst, and the powder spoiled, by the explosion of the first that happened to prove successful. We therefore in all cases used a voltaic battery and two conducting wires to every charge in our operations against the Edgar in 1844".*

When you consider the complexities and the enormities of the underwater projects that Col Pasley entered into, mastered and conquered, buoyed only by his own enthusiasm and the Victorian drive for scientific knowledge, then the audaciousness of his enterprise can only be likened to the 20th Century Race in Outer Space. Like that first Astronaut on the Moon who claimed that *"it was but a small step for man"*, Pasley's first dive in the Medway on 28 April 1838 was a physical step which was to change the face of working in Inner Space.

His contribution, through scientific and methodical engineer expertise, confirmed the new discipline of diving that the Deanes had pioneered. His efforts are not largely forgotten and unappreciated, but they formed the firm base for future diving and underwater engineering, from the North Sea Oil operations to the Recovery of the Mary Rose. Perhaps this last, involving so great a contribution by Sapper Divers, in the Solent, would have pleased him most.

